REMARKS

This amendment is submitted in response to the requirement in the July 25, 2011, office action for resubmission of the claims presented in the "4/17/05" amendment so there is compliance with 37 CFR 1.173(b)2. Apparently the July 25, 2011, office action should have referred to the April 7, 2006, Amendment because there was no April 7, 2005, amendment. Consequently, the April 7, 2006 amendment is resubmitted herein in a form believed to comply with 37 CFR 1.173(b)2.

The remaining issues in the July 25, 2011, office action are considered in an amendment submitted with this paper.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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Enclosure: Version with Markings to show changes made

VERSION WITH MARKINGS TO SHOW CHANGES MADE FROM THE AMENDMENT FILED NOVEMBER 22, 2004

This Appendix is for the Examiner's consideration.

1. (Original) An apparatus for generating plasma, the apparatus comprising:

a plasma reaction chamber having a window forming a magnetic/electrical field path into the chamber and a process gas supply for introducing process gas into the chamber;

a coil comprising at least a first coil segment and a second coil segment, the first and second coil segments being connected in series and disposed proximate an exterior surface of the window of the chamber so electromagnetic fields from said first and second coil segments are coupled through the window into the chamber;

a radio frequency source for coupling r.f. energy to the coil arrangement, the radio frequency source being effective to resonate a radio frequency current in the first and second coils; and

a power distributing component connected to one of the coil segments for controlling the flow of radio frequency current from the source through the first and second coil segments so different maximum radio frequency current amplitudes selectively flow from the source through the first and second coil segments at the same time to cause the process gas introduced into the chamber to be excited into a plasma having a relatively uniform plasma density in an area spanned by the first and second coil segments.

2. (Original) The apparatus of claim 1, wherein the power distributing component includes a circuit component connected in shunt with one of the coil segments.

3. (Original) The apparatus of claim 2, wherein the circuit component comprises an adjustable capacitor.

4. (Original) The apparatus of claim 2, wherein the circuit component comprises a switch for selectively effectively connecting one or both of the coil segments in series across a pair of excitation terminals connected to be responsive to radio frequency current derived from the radio frequency source.

5. (Original) The apparatus of claim 1, wherein the power distributing component includes a component for selectively disconnecting the first coil segment from the second coil segment so radio frequency current flows from the radio frequency source through the second coil segment but not through the first coil segment while the component disconnects the first coil segment from the second coil segment and radio frequency current flows from the radio frequency source through the first and second coil segments while the component connects the first coil segment to the second coil segment.

6. (Original) The apparatus of claim 5, wherein the component for selectively disconnecting comprises a switch.

7. (Original) The apparatus of claim 1, wherein the first and second coil segments are coplanar.

8. (Original) The apparatus of claim 1, wherein the first and second coil segments are concentrically arranged structures each including an inner terminal, an outer terminal and an arcuate conductor having at least one turn extending between the inner and outer terminals.

9. (Original) The apparatus of claim 1, wherein the first and second coil segments are powered by a single radio frequency power source, the first and second coil segments being connected to each other and the single radio frequency power source so radio frequency current flows from the radio frequency power source through a first excitation terminal of the coil connected to the first coil segment, thence through the coil to a second excitation terminal of the coil connected to the second coil segment, thence back to the source, the first and second excitation terminals being at opposite ends of the coil.

10. (Original) The apparatus of claim 1 wherein each of the coil segments includes an inner terminal, an outer terminal and an arcuate conductor portion having at least one turn extending between the inner and outer terminals, the first and second coil segments being connected in series across a pair of excitation terminals connected to be responsive to r.f current derived from the radio frequency source.

11. (Original) The apparatus of claim 10 wherein the exterior terminal of the first coil segment is connected to the interior terminal of the second coil segment.

12. (Original) The apparatus of claim 11 wherein the component is connected across the interior and exterior terminals of the first coil segment.

13. (Original) The apparatus of claim 12 wherein the first and second coil segments are concentric with each other.

14. (Original) The apparatus of claim 11 wherein the component includes a capacitor.

15. (Original) The apparatus of claim 13 wherein the component includes a switch for selectively causing (a) the first and second coil segments to be connected in series with each other while the switch is in a first position and (b) radio frequency current from the source not to flow in the first coil segment while the switch is in a second position.

16. (Original) The apparatus of claim 12 wherein the component includes a capacitor.

17. (Original) The apparatus of claim 12 wherein the component includes a switch for selectively causing (a) the first and second coil segments to be connected in series with each other while the switch is in a first position and (b) radio frequency current from the source not to flow in the first coil segment while the switch is in a second position.

18. (Original) The apparatus of claim 4 wherein the switch and coil segments are arranged so that (a) in a first position of the switch, radio frequency current from the radio frequency source flows in series through a first of the excitation terminals, thence in series through the first and second coil segments and thence through a second of the excitation terminals, and (b) in

a second position of the switch, radio frequency current from the radio frequency source flows in series through the first excitation terminal, thence through one of the coil segments but not through the second of the coil segments and thence through the second excitation terminal.

19. (Original) The apparatus of claim 1, wherein the first and second coil segments are powered by a single radio frequency power source, the first and second coil segments being connected to each other and the single radio frequency power source so radio frequency current flows from the power source through a first excitation terminal of the coil connected to the first coil segment, thence through the first and second coil segments to a second excitation terminal of the coil connected to the second coil segment, thence back to the source, the first and second excitation terminals being at opposite ends of the coil.

20. (Original) A method of generating a plasma having a substantially uniform density in a plasma reaction chamber, the method comprising the steps of:

introducing a process gas into the plasma reaction chamber;

supplying an excitation coil for the plasma with a radio frequency current resonant to the coil, the coil responding to the radio frequency current to produce a radio frequency field that excites the gas to a plasma, the coil comprising at least a first coil segment and a second coil segment connected in a radio frequency circuit, the coil being disposed proximate an exterior surface of a window of the chamber; and

selectively controlling the maximum amplitude of radio frequency current flowing through the first and second coil segments in a manner such that the plasma has a uniform plasma density in an area spanned by the first and second coil segments.

21. (Original) The method of claim 20, wherein the step of controlling the radio frequency maximum current amplitude is carried out by shunting one of the coil segments.

22. (Original) The method of claim 21, wherein the step of shunting is performed by causing a capacitor having a relatively high value to be connected in shunt with said one segment so substantial radio frequency current flows through the capacitor and a relatively low radio frequency current flows through said one segment.

23. (Original) The method of claim 21, wherein the step of shunting is performed by closing a switch across said one coil segment so the flow of the radio frequency current through said one coil segment is prevented.

24. (Original) The method of claim 20, wherein the step of controlling the radio frequency maximum current amplitude is carried out by disconnecting said one coil segment from the radio frequency circuit.

25. (Original) The method of claim 24, wherein the step of disconnecting is performed by opening a switch.

26. (Original) An apparatus for generating plasma, the apparatus comprising:
a plasma reaction chamber having a window forming a magnetic/electrical field path into the chamber and a process gas supply for introducing process gas into the chamber;
a radio frequency source arrangement;

a coil arrangement comprising a first coil segment and a second coil segment, the first and second coil segments being disposed proximate an exterior surface of the window of the chamber so radio frequency fields from said first and second coil segments are coupled through the window into the chamber, each of the coil segments including an inner terminal, an outer terminal and an arcuate conductor portion having at least one turn extending between the inner and outer terminals, the first coil segment being inside the second coil segment, the first and second coil segments being connected to the radio frequency source arrangement and arranged so a lower radio frequency maximum amplitude current from the source arrangement flows through the first coil segment than through the second coil segment, the radio frequency fields derived from the first and second coil segments interacting with the process gas introduced into the chamber so the process gas is excited to form a plasma having a relatively uniform plasma density in an area spanned by the first and second coil segments.

27. (Original) The apparatus of claim 20 wherein the coil arrangement for causing a lower radio frequency maximum amplitude current to flow through the first coil segment than through the second coil segment includes a relatively low non-inductive impedance shunting the first coil segment.

28. (Original) The apparatus of claim 20 wherein the source arrangement includes a single radio frequency source, the first and second coil segments being connected in series across a pair of excitation terminals responsive to radio frequency current derived from the single radio frequency source, radio frequency current from the single source flowing through one of the

excitation terminals, thence through both of the first and second coil segments, thence through the other excitation terminal.

29. (Original) A method of exciting plasmas in a plasma reaction chamber supplied with a process gas, the plasmas having differing characteristics at different times but being excited so they have substantially uniform density, the process gas being excited into a plasma by a coil coupling a radio frequency electromagnetic field into the chamber, the coil having spatially disparate plural segments relative to the excited plasma, the method comprising:

during a first interval while the excited plasma has a first characteristic, effectively arranging the segments in a first way and supplying radio frequency current to the coil so the radio frequency electromagnetic field coupled by the coil to the plasma has a first spatial configuration and amplitude to cause the plasma to have a first substantially uniform density,

during a second interval while the excited plasma has a second characteristic, effectively arranging the segments in a second way and supplying radio frequency current to the coil so the radio frequency electromagnetic field coupled by the coil to the plasma has a second spatial configuration and amplitude to cause the plasma to have a second substantially uniform density, the first and second characteristics, ways, and configurations differing.

30. (Original) The method of claim 29 wherein in the first way, first and second of said segments are connected to each other and a source of radio frequency current so the same radio frequency current flows from the source to the first and second segments, and in the second way the first and second segments are connected to each other and a source of radio frequency current so different radio frequency currents flow from the source to the first and second segments.

31. (Original) The method of claim 30 wherein in the first way, the first and second segments are connected in series with each other and to the source of radio frequency current.

32. (Original) The method of claim 31 wherein in the second way the first segment is connected to the source of radio frequency current and the second segment is arranged so current from the source of radio frequency current does not flow in the second segment.

33. (Original) The method of claim 31 wherein in the second way, the first and second segments are connected in series with each other and to the source of radio frequency current and an impedance is connected in shunt with the second segment.

34. (Original) The method of claim 33 further including changing the impedance so it has first and second values to provide the first and second ways, respectively.

35. (Original) The method of claim 29 wherein the first and second ways are respectively achieved by first and second settings of a component connected to a first of the segments.

36. (Original) The method of claim 35 wherein the component includes a switch, the switch when activated to the first setting connecting the first segment in series with a second of the segments so the radio frequency current flowing through the first segment flows in the second segment, the switch when activated to the second setting causing a finite non-zero radio frequency

current to flow from the source through the first segment and no radio frequency current to flow from the source through the second segment.

37. (Original) The method of claim 35 wherein the component includes a non-inductive impedance connected in series with a first of the segments and shunting a second of the segments, the impedance respectively having first and second values when the component is activated to the first and second settings.

38. (Original) The method of claim 29 wherein first and second of the segments are series connected to each other and the first and second ways are respectively achieved by first and second settings of a component connected to the first segment, the component when activated to the first setting causing radio frequency current flowing through the first and second segments to have a first relation with respect to each other, the component when activated to the second setting causing radio frequency current flowing through the first and second segments to have a second relation with respect to each other.

39. (Currently Amended) A low pressure plasma processor for treating a workpiece with a plasma comprising a low pressure chamber ~~where the~~ including a workpiece ~~is adapted to be located~~ holder for carrying a workpiece that is adapted to be affected by the plasma, the chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for treating the workpiece, a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil including interior, intermediate and peripheral portions, the interior, intermediate and peripheral portions having turns connected to each other and arranged so the

magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion.

40. (Original) The processor of claim 39 wherein the interior portion includes plural radially and circumferentially extending turns, the exterior segment having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions.

41. (Original) The processor of claim 40 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.

42. (Original) The processor of claim 40 wherein the exterior portion includes plural radially and circumferentially extending turns.

43. (Original) The processor of claim 40 wherein the interior portion includes plural spiral like turns.

44. (Original) The processor of claim 43 wherein the exterior portion includes plural spiral like turns.

45. (Currently Amended) A coil for use with a low pressure plasma processor for treating a workpiece with an RF plasma wherein the processor includes a low pressure chamber ~~where the workpiece is adapted to be located, and~~ including a workpiece holder for carrying a workpiece that is adapted to be affected by the plasma, the chamber ~~has~~ having an inlet for introducing into the chamber a gas which can be converted into the RF plasma for treating the workpiece, the coil being adapted to be positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil comprising: interior, intermediate and peripheral portions, the interior, intermediate and peripheral portions having turns connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion.

46. (Previously Presented) The coil of claim 45 wherein the interior portion includes plural radially and circumferentially extending turns, the exterior portion having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions.

47. (Original) The coil of claim 46 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.

48. (Original) The coil of claim 46 wherein the exterior portion includes plural radially and circumferentially extending turns.

49. (Original) The coil of claim 46 wherein the interior portion includes plural spiral like turns.

50. (Original) The coil of claim 49 wherein the exterior portion includes plural spiral like turns.

51. (Currently Amended) A coil for use with a low pressure plasma processor for treating a workpiece with an RF plasma wherein the processor includes a low pressure chamber ~~where the~~ having a workpiece holder for carrying a workpiece [[is]] adapted to be ~~located~~ treated by plasma in the chamber, and the chamber has an inlet for introducing into the chamber a gas which can be converted into the RF plasma for treating the workpiece, the coil being adapted to be positioned outside the chamber to couple an RF field to the gas for exciting the gas to the plasma state, the coil comprising: interior, intermediate and peripheral portions, the interior portion including plural radially and circumferentially extending turns, the exterior portion having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions, the lead having at least a portion that is straight.

52. (Original) The coil of claim 51 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.

53. (Original) The coil of claim 51 wherein the exterior portion includes plural radially and circumferentially extending turns.

54. (Previously Presented) A low pressure plasma processor for treating a workpiece with a plasma comprising a low pressure chamber where the workpiece is adapted to be located, the chamber having an inlet for introducing into the chamber a gas which can be converted into the plasma for treating the workpiece, a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, the coil including interior, intermediate and peripheral portions, the interior portion including plural radially and circumferentially extending turns, the exterior segment having at least one circumferentially extending turn, the intermediate portion being configured so it (a) does not include a complete turn, (b)is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions, the lead having at least a portion that is straight.

55. (Original) The processor of claim 54 wherein the interior, intermediate and exterior portions are connected in series, the interior and exterior portions respectively including terminals for connection to a source of RF.

56. (Original) The processor of claim 54 wherein the exterior portion includes plural radially and circumferentially extending turns.

57. (Previously Presented) The coil of claim 51 wherein the lead is straight throughout its length.

58. (Previously Presented) The processor of claim 54 wherein the lead is straight throughout its length.

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